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Bennett J. Berson

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Ajit Chowdhury  
Thomas R. Stolzenburg

Date: December 3, 2002

Serial No.: 09/832,078

Art Unit: 1754

Filed: 04/10/2001

Examiner: Eileen Enad Nave

For: PROCESS FOR REDUCTION OF  
BIOACCESSIBILITY OF HEAVY METALS

Docket: 780202.90075

RESPONSE

Commissioner For Patents  
P O Box 2327  
Arlington VA 22202

Dear Sir:

In a non-final Office Action mailed July 3, 2002, the Examiner in charge of the application rejected Claims 1-25 under 35 U.S.C. §103(a) as being unpatentable over Stanforth et al. (US 5,202,033) in view of Diel (US 5,431,825), citing, but not explicitly applying, the factors set forth in Graham v. John Deere Co. (1966). Stanforth et al. disclosed treating heavy metal-contaminated materials with a phosphate source or a carbonate source or ferrous sulfate under wetting conditions to reduce leaching. Diel disclosed using chlorides and sulfates of Fe(II) as reducing agents for heavy metals to stabilize and reduce leaching.

In the Examiner's view, the skilled artisan (1) would combine Stanforth et al. with Diel to arrive at the claimed invention and (2) could readily determine the specific reaction conditions of the narrower claims by routine experimentation. Applicants respectfully traverse the rejections for the following reasons.

While true (1) that Diel teaches that chlorides and sulfates of Fe(II) are useful heavy metal reducing agents, and (2) that Stanforth discloses using carbonates, phosphates and sulfates to control heavy metal leaching, particularly ferrous sulfate for controlling chromium



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leaching, the Examiner's stated basis for combining the two references falls short and the invention is not rendered obvious by these documents.

Diel uses the indicated compounds as reducing agents (in combination with an essential metallic element in non-ionic form, which is not employed in the claimed method) to form a reduced mixture that is subsequently stabilized and disposed, e.g. by landfilling, incineration or other disposal method. Diel states that "stabilization of the reduced mixture with a stabilizing agent is an important aspect of this invention". This is distinguished from the present invention in at least three ways:

First, Diel and Stanforth do not employ their recited agents (which notably are different agents) for the same purpose, nor for the same purpose as the applicants. It is therefore incorrect to assert that the claimed invention is a mere combination of equivalents known for the same purpose. The examiner points to Diel's characterization of chlorides and sulfates as good reducing agents, but the chlorides and sulfates are not employed in the present invention as reducing agents. Instead, when all are combined in the present method, the set of phosphate, chloride, and iron additives yield stabilized, highly insoluble metal chloropyromorphites that can stabilize without solidification, while at the same time rendering the metal non-bioaccessible. The advantageous effect of the combination cannot be predicted from either cited document, and thus neither provides a basis for combining the two or rendering obvious the claimed invention.

Second, the reduced mixture of Diel contains metals chemically reduced to the zero valent state (see Diel, p. 2, lines 60-66). In the claimed method, reduction of such metals to the zero valent state is not done and could hinder the desired formation of highly insoluble metal chloropyromorphites (particularly lead chloropyromorphite) (see Specification, paragraph bridging pages 2 and 3).

Third, with regard to the "important aspect" of stabilizing the reduced mixture, Diel only discloses solidifying the mixture with a stabilizing agent, preferably an alkaline stabilizing agent, as described in col. 4. While such solidification methods can render a metal contaminant non-TCLP toxic, the contaminant is not rendered non-bioaccessible.

Applicants further note that Diel and Stanforth conflict with one another on the topic of solidification. While Diel touts solidification as desirable, Stanforth teaches away from solidification (see Col. 3, l. 34-39), while favoring instead a process for chemically immobilizing insoluble salts of the contaminant metal (see Col. 5, l. 36-37 and Col. 8, l. 28-29), where the metal is present in ionic, not zero valent, form. Accordingly, a combination of

Stanforth with Diel would not yield the claimed invention because the skilled artisan would not know how to stabilize the product of the method, would not know which method steps to employ, and would not know whether to produce a zero valent reduced metal or to convert the reduced metal to an ionic form.

To the contrary, it is the applicants' position that the cited patents provide separate and independent approaches suited only for reducing leaching to levels acceptable under, e.g., the TCLP Test, but that neither addresses bio-accessibility of the heavy metals that remain mobile. As the Background in present application stated, "the known processes for stabilizing heavy metals to control metal leaching [which, parenthetically, include the cited Stanforth et al. and Diel patents] do not include processes for rendering metal-contaminated particulate mater nonbioaccessible." In contrast, the inventors disclosed that further steps are needed to reduce bioaccessibility and addressed this point by teaching instead that heavy metal bioaccessibility can be reduced by treating heavy-metal contaminated particulate matter with a phosphate additive, a chloride additive and an iron additive to form highly insoluble metal chloropyromorphites. Neither cited patent discloses, teaches or suggests that a change in formulation to include phosphate, chloride and iron would cause insoluble metal chloropyromorphites to form in amounts sufficient to reduce bioaccessibility.

Additionally, the two patents teach away from further improvements to heavy-metal leaching processes, as both purport to achieve their goal of forming insoluble heavy metal complexes, albeit by different processes. Because the two patents (1) provide distinct and non-overlapping chemistries to address a problem other than that solved by the applicants and (2) fail to contemplate the goal of reducing bioaccessibility, the skilled artisan would have had no motivation to combine the two. The mere fact that comparable heavy-metal containing materials are treated differently in two different methods cannot teach that the two treatments should be combined, particularly when neither cited patent even hints at the advantageous result now recognized by the applicants.


At best, the skilled artisan might have been tempted to try to integrate the Stanforth et al. and Diel processes, but this is not the test for obviousness absent a reasonable expectation of success. That expectation would have been absent here, particularly in view of potential uncharacterized interfering effects on leachability or on bioaccessibility that could arise after combining the additives of one process with the additives of the other, not to mention the noted inconsistencies between the methods.

For all of the reasons noted above, the applicants further believe that the narrower embodiments of the claimed invention go well beyond merely routine experimentation to select specific amounts of different additives or alkali.

Accordingly, applicants respectfully request reconsideration of the merits of this patent application. A petition for two months extension of time is submitted with this response so the response will be deemed to have been timely filed. If any additional extension of time is due, please consider this to be a request for the appropriate extension of time and a request to charge the fee due to Deposit Account No. 17-0055.

No other fee is believed due in connection with this response, but should such a fee be due, please charge the fee to the same deposit account.

Respectfully submitted,



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